OFFICE CHANNEL UNIT DATAPORT (OCUDP)

628350, 628352, 628354 AND 628356

GENERAL DESCRIPTION

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1. GENERAL

1.01 This Section provides a general description of the ITT D448 office channel unit dataport (OCUDP), 628350, 628352, 628354, and 628356 (Fig. 1), to the functional block diagram level.

1.02 Whenever this Section is reissued, the reasons for reissue will be listed in this paragraph.

1.03 The OCUDP interfaces the D448 PCM trunk carrier system common equipment with baseband bipolar line signals (via 4-wire local loop facility) from an ITT data service unit (DSU), channel service unit (CSU), or equivalent. It may be used as the central office (C.O.) terminating end for private line data service or the AT&T Digital Data Service (DDS®) network.

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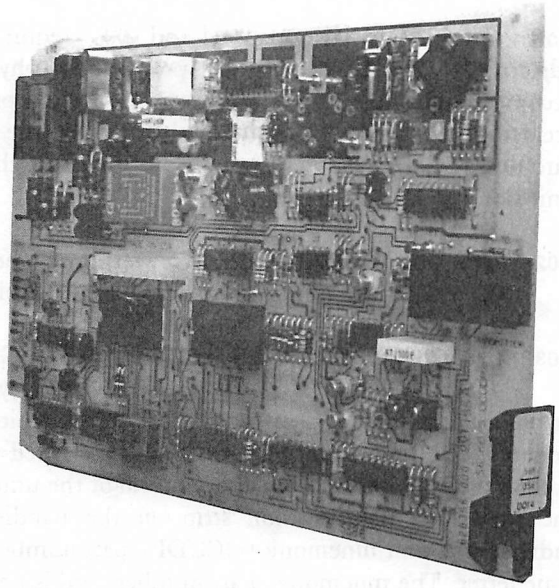

Fig. 1—OCUDP, 628356

1.04 The principle functions of the unit are:

(a) In the receive direction, to convert 2.4, 4.8, 9.6, and 56.0 kb/s baseband bipolar line signals from a 4-wire loop facility to DS-0A level data for use by the D448 transmit logic unit (TLU);

(b) In the transmit direction, to convert the DS-0A level (non-multiplexed) data from the D448 receive logic unit (RLU) to the appropriate baseband bipolar signal rate for transmission over a 4-wire loop facility;

(c) To provide error correction on PCM data accepted from the D448 RLU;

(d) To place the OCUDP in the appropriate loopback mode upon reception of specific control codes on the D448 PCM receive bus, and/or map these control codes into the baseband bipolar data stream; and

(e) To map specific control codes received via the baseband bipolar data stream onto the PCM transmit bus.

2. DESCRIPTION

2.01 The unit mounts in the D448 multiplex shelf (any channel unit position) in connectors J1A through J24A (for digroup A) or connectors J1B through J24B (for digroup B). Installation procedures are provided in Section ITTR-18-442.

Note: The 628356, Groups -004 and -006, requires two adjacent (N, N + 1) channel unit positions. It physically occupies only one of these positions. Hence, to prevent accidental use of the N + 1 channel time slot, the blank card unit (BCU), 628099, is installed in the N + 1 channel unit slot.

2.02 The unit is available in five versions. The differences in the versions are described in Table A.

2.03 The 628350, 628352, 628354, and 628356, Groups -001 and -003, OCUDPs consist of an epoxy-glass printed circuit board (PCB) and associated circuit components. The lower front edge of the PCB is fitted with a handle to facilitate insertion and removal of the unit from the shelf. An identification strip on the handle face indicates the unit mnemonic (OCUDP), part number, and issue letter. The mnemonic, part number, and issue letter are also located on the component side of the PCB.

2.04 The 628356, Groups -004 and -006, OCUDP consists of two epoxy-glass PCBs and associated circuit components. The lower front edge of the main PCB is fitted with a handle to facilitate insertion and removal of the unit from the shelf. An identification strip on the handle face indicates the unit mnemonic (OCUDP), part number, and issue letter. The mnemonic, part number, and issue letter are also located on the component side of the main PCB.

2.05 The test access jack (J1) is located on the front edge of the PCB for the 628350, 628352, 628354, and 628356, Groups -001 and -003, OCUDPs, and on the front edge of the main PCB for the 628356, Groups -004 and -006, OCUDP.

2.06 Printed circuit wiring is etched on both sides of the PCBs. For the 628356, Groups -004 and -006, OCUDP, the PCBs are connected via a connector assembly. The unit inputs and outputs terminate in gold-plated contacts on the rear edge of the PCB (main PCB for 628356, Groups -004 and -006, OCUDP). These contacts mate with a 60-pin contact edge connector on the rear of the multiplex shelf.

3. FUNCTIONAL OPERATION (FIG. 2)

RECEIVE CIRCUITRY

3.01 Baseband bipolar line signals from the customer location are received on the T and R leads via the 4-wire loop facility. The surge protection circuit on the input provides lightning protection and transformer T1 presents a 135-ohm impedance to the 4-wire loop. From T1, the received data enters a high-frequency noise filter and is then sent to the automatic line build-out (ALBO) circuit. The ALBO circuit introduces attenuation when shorter than maximum length lines are used.

TABLE A

PART NO.	MNEMONIC	DESCRIPTION
628350-000-001	OCUDP/2.4K	Office Channel Unit Dataport, 2.4 kb/s; provides point-to-point 2.4 kb/s data transmission with error correction.
628352-000-001	OCUDP/4.8K	Office Channel Unit Dataport, 4.8 kb/s; provides point-to-point 4.8 kb/s data transmission with error correction.
628354-000-001	OCUDP/9.6K	Office Channel Unit Dataport, 9.6 kb/s; provides point-to-point 9.6 kb/s data transmission with error correction.
628356-000-001 and 628356-000-003	OCUDP/56K	Office Channel Unit Dataport, 56.0 kb/s; provides point-to-point 56.0 kb/s data transmission without error correction.
628356-000-004* and 628356-000-006*	OCUDP/56E	Office Channel Unit Dataport, 56.0 kb/s; provides point-to-point 56.0 kb/s data transmission with error correction.

*Unit requires two channel unit time slots and therefore occupies two channel unit positions.

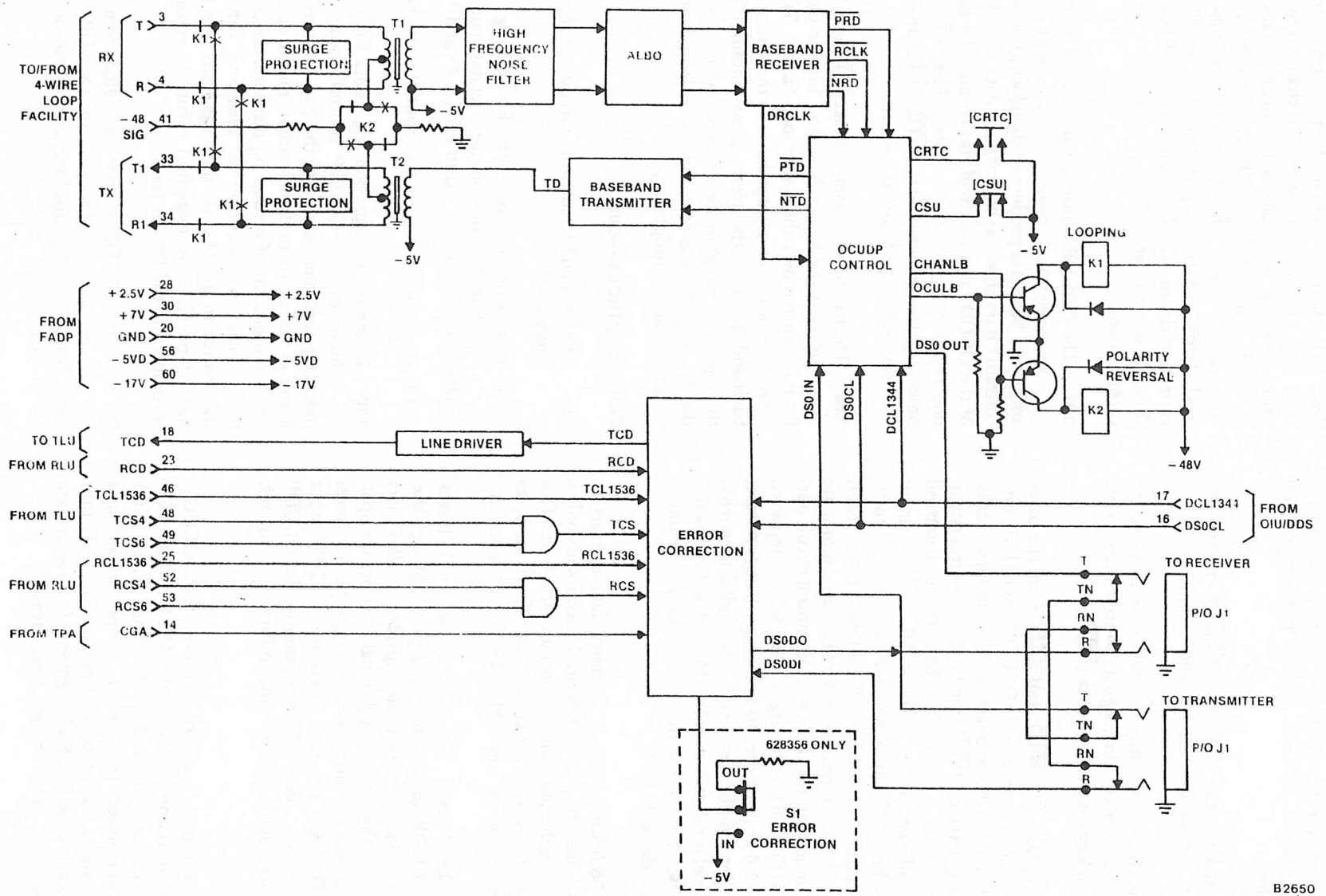

Fig 2—OCUDP, Functional Block Diagram

3.02 The received data stream then enters the OCUDP baseband receiver. The baseband receiver interfaces the received baseband bipolar data stream to the OCUDP control circuit. The baseband receiver performs two functions:

(a) It extracts a timing signal ($\overline{\text{RCLK}}$) from the baseband bipolar data stream; and

(b) It produces two unipolar data streams from the baseband bipolar line signal, positive receive data ($\overline{\text{PRD}}$) and negative receive data ($\overline{\text{NRD}}$).

3.03 The signals $\overline{\text{PRD}}$, $\overline{\text{NRD}}$, and $\overline{\text{RCLK}}$ from the baseband receiver enter the OCUDP control circuit. Customer data is presented to the OCUDP in 6-bit words. Upon a falling edge of $\overline{\text{RCLK}}$, the OCUDP control circuit sends a sampling clock (DRCLK) back to the baseband receiver to read customer data. The OCUDP control circuit takes each subrate 6-bit word and adds a control bit and a stuff bit to form an 8-bit byte. For subrate service (2.4, 4.8, and 9.6 kb/s), it repeats each data byte an appropriate number of times such that the OCUDP control circuit output (DS0 OUT) is a 64.0 kb/s signal (the signal is repeated 20 times for 2.4 kb/s service, 10 times for 4.8 kb/s service, and 5 times for 9.6 kb/s service). In the digital hierarchy, this signal level is referred to as DS-0A. A detailed description of the OCUDP control circuit functions may be found in Para. 3.09 through 3.12.

Note: For 56.0 kb/s service, customer data appears in 7-bit words. Thus, the OCUDP control circuit adds only a control bit to each data word to form an 8-bit byte. This operation produces the 64.0 kb/s signal. The 8-bit bytes are not repeated to reach 64.0 kb/s for 56.0 kb/s service.

3.04 The DS-0A level customer data (DS0 OUT) leaves the OCUDP control circuit and passes through the J1 test access jacks. These jacks are provided to allow data test set access to the DS-0A level signal in either the span line or 4-wire loop facility direction. From the test access jacks, the DS-0A level data enters the OCUDP error correction circuit. A detailed description of the OCUDP error correction circuit may be found in Para. 3.13 through 3.15.

3.05 The customer data is strobed out of the OCUDP error correction circuit by the TCL1536 and TCS strobes which come from the TLU. The data (at the DS-0A level) is multiplexed into the PCM bit stream and transmitted via the appropriate line interface (LI) unit onto the span line facility. Each segment of customer data appears as one channel of the PCM bit stream.

TRANSMIT CIRCUITRY

3.06 The digital PCM signal from the span line facility is broken up into its associated channels by the D448 common equipment. Channels containing customer data are strobed into the OCUDP error correction circuit (on the RCD lead) via the RCL1536 and RCS strobes from the RLU. Error correction is performed by the OCUDP error correction circuit. The DS-0A level signal (DS0DO) is sent through the test access jack, and then to the OCUDP control circuit.

3.07 The OCUDP control circuit takes the DS-0A level customer data, discards the repeated bytes and the additional bits, and produces a signal which is the original customer data signal at the original data rate. The output of the OCUDP control circuit is two unipolar bit streams, one representing positive transmit data ($\overline{\text{PTD}}$) and the other negative transmit data ($\overline{\text{NTD}}$). $\overline{\text{PTD}}$ and $\overline{\text{NTD}}$ are then sent to the baseband transmitter.

3.08 The baseband transmitter takes $\overline{\text{PTD}}$ and $\overline{\text{NTD}}$ and converts them to a baseband bipolar data stream for transmission over the 4-wire loop facility. Transformer T2 presents a 135-ohm impedance to the 4-wire loop. The baseband bipolar data stream passes through T2, passes through the surge protection circuit, and is transmitted via the T1 and R1 leads over the 4-wire loop facility to the customer station equipment.

OCUDP CONTROL CIRCUIT

3.09 The OCUDP control circuit performs two functions:

(a) It provides the necessary bit stuffing and byte repetition to bring the customer data rate up to the DS-0A level (as explained in Para. 3.03 and 3.07); and

(b) It provides recognition of control code sequences.

3.10 In the receive direction (i.e., data from customer location), the OCUDP control circuit examines incoming customer data from the baseband receiver and monitors the signal to detect various modes of operation. Upon recognition of certain bipolar violation sequences, the received bit sequence is modified before being transmitted to the TLU via the TCD lead. This modification (done via code mapping) occurs to ensure proper encoding into the DS-0A level.

Note: If the OCUDP receives no signal from the local loop for approximately 2 seconds, the OCUDP control circuit will transmit the out-of-service code to the PCM bus via the TCD lead.

3.11 OCUDP mode control is implemented in the transmit direction (i.e., data from the span line facility) only. In the transmit direction, the OCUDP control circuit examines the 8-bit data words from the error correction circuit for the presence of OCUDP, channel (local line), or digital (remote terminal) loopback codes. After four consecutive bytes of a particular loopback code are detected, the OCUDP is placed in that loopback mode. Once placed in a particular loopback mode, the OCUDP will remain in that mode until four consecutive bytes that do not contain the code are received.

3.12 When the OCUDP control circuit detects a digital loopback code in the DS-0A level signal, the OCUDP will transmit this loopback code to the customer DSU. Reception of the channel loopback code causes the baseband transmitter/receiver to reverse the polarity of simplex (sealing) current on the 4-wire loop (via relay K2) and inhibit violation sequences from being transmitted. Reception of the OCUDP loopback code causes the transmit and receive tip/ring pairs (T1 and R1, T and R) to be connected via relay K1.

ERRROR CORRECTION CIRCUIT

3.13 The OCUDP error correction circuit performs error correction on the 8-bit data bursts from the PCM receive bus (RCD). For subrate service, the error correction function is provided by examining each bit of the repeated bytes of customer data (Para. 3.03). A corrected word is formed by taking a "majority vote." This is, each bit of each repeated byte is examined, a majority vote is taken, and the bytes are corrected so that all are identical. The corrected word is then sent to the OCUDP control circuit.

3.14 For 56.0 kb/s service, error correction is implemented via use of a special cyclic error correction code since there are no repeated bytes to examine and vote upon. This cyclic error correction code is a mathematical algorithm which allows detection and correction of all single and double bit errors.

3.15 The 56.0 kb/s OCUDP, Groups -004 and -006, requires two time slots (channel unit positions N and N + 1) to perform error correction. Therefore, if the OCUDP is in channel unit slot N, it transmits data messages in time slot N. Time slot N + 1 is used for a parity word. This 8-bit parity word is joined with the 8-bit data message in time slot N to form a 16-bit word. It is this 16-bit word that is manipulated (via algorithm) to produce a corrected DS-0A level signal from the 56.0 kb/s signal.

Note 1: When using 628356, Groups -004 and -006, OCUDPs in channel unit slot N, a BCU, 628099, is required in the adjacent channel unit slot (N + 1).

Note 2: The error correction circuit also provides recognition of carrier group alarm (CGA). If the OCUDP receives a CGA, then it will transmit a "multiplexer out-of-sync" signal to the baseband loop. The customer station equipment will receive this signal and interpret it as an "out-of-service" code.

SIMPLEX CURRENT CONTROL

3.16 Simplex, or sealing, current is provided on the transmit and receive pairs to prevent oxide build-up on cable splices. This current is supplied via the −48SIG lead on the OCUDP. The current is limited to 20 mA but should be no less than 4 mA. The OCUDP control circuit can cause the simplex control to reverse the normal polarity of the current which will initiate a loopback of the channel at the customer's premises (via reversal of relay K2). The transmit pair (T1, R1) is normally negative with respect to the receive pair (T, R). Reversal will occur within 5 milliseconds of the OCUDP loopback command.

4. OPTIONS

4.01 The OCUDP is equipped with two screw-type options which allow the unit to be configured for differing applications. Option screw [CSU] provides the ability to configure the OCUDP for use with a customer having a DSU or CSU at his location. The unit is shipped with option screw [CSU] selected (down) for operation with a DSU.

4.02 Option screw [CRTC] (customer remote test control) allows the user to pass the baseband DSU loopback code into the outgoing DS-0A and DS-1 streams. This option is provided for future applications. The unit is shipped with option screw [CRTC] not selected (up). Option selection procedures are provided in Section ITTR-18-442.

4.03 The 628356 OCUDP has a slide switch (S1) to allow 56.0 kb/s error correction to be switched IN or OUT. The unit is shipped with the switch in the OUT position.

CAUTION: The 628356, Groups -001 and -003, must have S1 in the OUT position or data channel malfunction will result.

5. SPECIAL RESTRICTIONS

5.01 The 56.0 kb/s OCUDP with error correction is equipped with error correction switch (S1) which allows the error correction features to be disabled. If error correction is not used, the switch should be in the IN position. If error correction is not used, the adjacent time slot normally occupied by the BCU may be used by another dataport or channel unit.

Note: The 56.0 kb/s OCUDP with error correction (Groups -004 and -006) must be removed to operate the error correction switch. It is recommended that this switch be left in the IN position.

CAUTION: Groups -001 and -003 of the 628356 OCUDP must have the error correction switch in the OUT position or data channel malfunction will result.

6. TEST AND MAINTENANCE FEATURES

6.01 Test access jack (J1) provides access to the transmit and receive DS-0 level signals for testing purposes. Refer to Fig. 1 for the physical location of this feature.

7. TECHNICAL SUMMARY

7.01 A summary of the technical specifications of the units is given in Table B.

8. REPLACEABLE PARTS

8.01 The units contain no field-replaceable parts.

9. REFERENCES

9.01 The engineering drawings noted in Table C were used in the preparation of this Section.

9.02 Related information on the units may be found in Section ITTR-18-442, Dataport Channel Units — Option Selection and Installation.

TABLE B

ITEM	SPECIFICATION
DC POWER	
Voltage +2.5V +7.0V −5.0V −17.0V −48 Signaling Battery	Maximum Current Drain 20 uA 25 mA 95 mA (105 mA for 628356, Group -006; 20 mA for 628356, Group -004) 10 mA 40 mA
INPUT IMPEDANCE	135 ohms
OCUDP-TO-CUSTOMER STATION CABLE INSERTION LOSS	34 dB maximum
OPERATING ENVIRONMENT	
Temperature Humidity Altitude	0° to 55°C To 95% at 40°C (no condensation) To 14,000 ft (4,300 m)
DIMENSIONS	
Height Width Depth	5.9 in (15.0 cm) 0.8 in (1.9 cm) 9.7 in (24.6 cm)
WEIGHT	0.6 lb (0.3 kg)

TABLE C

TYPE	DRAWING NO.
Assembly	628350-000
Schematic	628350-002
Assembly	628352-000
Schematic	628352-002
Assembly	628354-000
Schematic	628354-002
Assembly	628356-000
Schematic	628356-002